**Lesson 3 – Webquest Epigenetics**

**Go to the following URL**

[**http://learn.genetics.utah.edu/content/epigenetics/**](http://learn.genetics.utah.edu/content/epigenetics/)

**Respond to the questions below for each section at the website.**

* 1. [**THE EPIGENOME AT A GLANCE**](http://learn.genetics.utah.edu/content/epigenetics/)

**An animated introduction to the epigenome and how it instructs DNA.**

**Assessment Questions**

* **Describe the physical state of the genome (tightly wrapped, or relaxed) when genes are inactive.**
* **Describe the physical state of the genome when genes are active.**
  1. [**GENE CONTROL**](http://learn.genetics.utah.edu/content/epigenetics/control/)

**Change the level of gene expression in a cell with a turn of the dial!   
  
A close look at the action of epigenetic molecules on the structure of DNA, and the resulting mRNA transcripts as the level of expression changes for the GFP gene in a glowing cell.**

**Assessment Questions**

* **Describe the following characteristics when a gene is active:**
* **Is the gene tightly or loosely wound around histones?**
* **Are there many or few methyl molecules attached to the gene?**
* **Are there many or few acetyl molecules attached to the genes associated histones?**
* **Are there many or few mRNA transcripts?**
* **Describe the following characteristics when a gene is inactive:**
* **Is the gene tightly or loosely wound around histones?**
* **Are there many or few methyl molecules attached to the gene?**
* **Are there many or few acetyl molecules attached to the genes associated histones?**
* **Are there many or few mRNA transcripts?** 
  1. [**THE EPIGENOME LEARNS FROM ITS EXPERIENCES**](http://learn.genetics.utah.edu/content/epigenetics/epi_learns/)

**Epigenetic tags record the gene-regulating signals the cell receives.**

**Assessment Questions**

* **True or False. Cell signals play a a role in shaping gene expression only during development.**
* **What molecule is primarily responsible for carrying cell signals to DNA?**
* **What are the two functions of gene regulatory proteins?**
* **Are epigenetic tags passed to daughter cells?**
  1. [**EPIGENETICS & INHERITANCE**](http://learn.genetics.utah.edu/content/epigenetics/inheritance/)

**Parents have a role in shaping the epigenome.**

**Assessment Questions**

* **Explain reprogramming.**
* **Does reprogramming effect all epigenetic tags?**

**5.** [**IDENTICAL TWINS: PINPOINTING ENVIRONMENTAL IMPACT ON THE EPIGENOME**](http://learn.genetics.utah.edu/content/epigenetics/twins/)

**Why do the physical characteristics of identical twins diverge as they age?  
  
Follow the interaction of the environment and the genome in a pair of twins over time and learn how twins can help identify genetic traits.**

**Assessment Questions**

* **Often, the physical characteristics of genetically identical twins become increasingly different as they age, even at the molecular level. Explain why this is so. (use the terms "environment" and "epigenome")**
* **Name 3-4 environmental factors that influence the epigenome.**
* **What is an imprinted gene?**

**6.** [**LICK YOUR RATS**](http://learn.genetics.utah.edu/content/epigenetics/rats/)

**What kind of mother are you? Care for a rat pup and see how you shape its epigenome.**

**Assessment Questions**

* **Explain how a high-nurturing mother rat shapes her pup's epigenome, and what that pup's response to stress will be.**
* **In rats, does licking by the mother activate, or deactivate her pup's GR gene?**
* **Explain how cortisol and the GR protein work together in the brain to relax a rat pup. You may draw a diagram.**
* **The rat nurturing example shows us how parental behavior can shape the behavior of their offspring on a biochemical level. Relate this to humans and think about the personal and social implications. Record your thoughts.**

**7.** [**NUTRITION & THE EPIGENOME**](http://learn.genetics.utah.edu/content/epigenetics/nutrition/)

**What you eat can change your gene expression.**

**Assessment Questions**

* **Explain how the food we eat affects gene expression.**
* **Can the diets of parents affect their offspring's epigenome?**

**8.** [**EPIGENETICS & THE HUMAN BRAIN**](http://learn.genetics.utah.edu/content/epigenetics/brain/)

**Epigenetic tags interact with genes that affect behavior**

**Watch the video.**

**Assessment Questions**

* **Discuss 3 ways that epigenetics is thought to be related to behavior.**

**Epigenetics Assignment 20 points**

Write a 5 paragraph persuasive essay: Why is nature vs. nurture no longer a debate? The essay must include:

1. Introductory paragraph
   * 1. Statement of your position
     2. A definition of epigenetics.
     3. How the epigenome is controlled via cysteine methylation and histone modification.
2. Three paragraph examples to support your argument:
   1. Identical twins
   2. Nurturing behavior of mother rats
   3. Obesity
   4. Mood Disorders
3. Closing paragraph – Summation

**See Attached Rubric**

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In order to write the essay:

1. Review your powerpoint for information about cysteine methylation and histone modification.
2. Use the information from your webquest from the University of Utah Epigenetics website.

<http://learn.genetics.utah.edu/content/epigenetics/>

1. Another site of interest which may provide information – Please view for homework.

<http://www.pbs.org/wgbh/nova/body/epigenetics.html>

Click on program about identical twins

Click on a “A tale of two mice” (about the Agouti gene)

Click on “Epigenetics”

**5 Paragraph persuasive essay Honors**

|  |  |  |  |
| --- | --- | --- | --- |
| **Category** | **3** | **2** | **1** |
| **Intro. Paragraph** | **Lead-in sentence grabs reader's attention, gives clear thesis statement with three points writer will discuss.** | **Lead-in statement mildly attention grabbing, gives weak thesis with less than three points** | **Lead-in statement is weak. does not grab reader's attention** |
| **3 Body Paragraphs** | **3 to 5 sentences per paragraph, transitions are smooth, vocabulary is academic, keeps reader's attention. Each paragraph gives 2 or 3 details supporting points made in thesis statement.** | **Somewhat smooth transitions, vocabulary needs work. Only 1 detail supporting points in thesis statement.** | **Does not keep reader's attention, transitions are unclear. No details** |
| **Conclusion Paragraph** | **Thesis is paraphrased in an interesting manner, concludes paper clearly, vocabulary is academic. Intriguing closing statement.** | **Thesis is paraphrased, does not clearly conclude paragraph. Uninteresting closing statement.** | **No thesis paraphrased, unclear conclusion of paper. Poor closing.** |
| **Mechanics/Usage/Grammar** | **Very few mechanical problems in paper, no spelling errors, little or no grammar problems, paper is formatted properly, great sentence structure, on time** | **Some mistakes and spelling errors, confusing format, some grammar problems, fair sentence structure.** | **Many spelling mistakes, needs to be edited and revised extensively, messy format, poor structure, late** |